Plan

**Summary**

* Write about the main findings and conclusions of the project

**Introduction**

* Describe the task
* Design of robot

**Method**

* Implementation of one or two of P/P+I/P+D/Lead/Lag/PID control on each motor.
* State any assumptions made when deriving equations of motion, e.g. mass of link is negligible, or inductance is neglected.
* Describe the code and anything that you may have added to improve control
* Describe some of the multivariable control content, for example in simulation
* Discuss how gains were derived e.g. experimentally
* Any modifications made to control to avoid integrator windup/noisy excessive controls (see Notes on PID controller implementation on blackboard)

**Results**

* Show the drawing results of the three shapes. State the dimensions, show the shape drawn and what it was supposed to draw. State the time taken to draw the shape.
* Plot of reference angle and output angle
* Any simulation results

**Discussion**

* Discuss the merits and drawbacks of control method (PI/PID…)
* Reasons why shapes don’t match up exactly (backlash), explain how this error due to backlash can be reduced (changing the reference angle etc.)
* Use the Serial plotter in Arduino to show the reference and output angles on a graph.
* Multivariable control techniques: SFC and LO Observer
* Non-linear control techniques: Feedback linearization and gain scheduling
* Discuss design improvements that were made/needed, e.g. blue tack to reduce movement.
* Limitations/improvements to design and control of robot as a whole.